

Having described the invention, the following is claimed:

1. A method of forming a heat resistant body, said method comprising the steps of:

providing a mixture of particulate silicone based material and small elements which are hollow,

heating the mixture of particulate silicone based material and small elements which are hollow to a temperature between about 200°F and 400°F, and

cooling the particulate silicone based material until a solid body is formed, said solid body contains cavities which were formed in the particulate silicone based material by the small elements, said solid body being resistant to melting and thermal decomposition when heated to temperatures of at least 3000°F.

2. A method as set forth in claim 1 further including the step of forming a layer of particulate silicone based material which is free of the small elements which are hollow on at least one side of the mixture of particulate silicone based material and small elements which are hollow, heating the layer of particulate silicone based material to a temperature between about 200°F and about 400°F along with the mixture of particulate silicone based material and small elements which are hollow, and cooling the layer of particulate silicone based material along with the particulate silicone based material which was mixed with the small elements which are hollow, said layer of particulate silicone based material and the particulate silicone based material which was mixed with the small elements which are hollow

form a solid one-piece body which is resistant to melting and thermal decomposition when heated to a temperature of at least 3000°F

3. A method as set forth in claim 2 further including the step of applying pressure against the layer of silicone based particulate material and against the mixture of particulate silicone based material and small elements which are hollow.

4. A method as set forth in claim 2 further including the step of shaping the layer of particulate silicone based material and the particulate silicone based material which is mixed with small elements which are hollow to a desired configuration prior to heating of the layer of particulate silicone based material and the particulate silicone based material which is mixed with small elements which are hollow to a temperature between about 200°F and 400°F.

5. A method as set forth in claim 2 further including the step of shaping the layer of particulate silicone based material and the particulate silicone based material which is mixed with small elements which are hollow to a desired configuration after heating of the layer of particulate silicone based material and the particulate silicone based material which is mixed with small elements which are hollow to a temperature between about 200°F and 400°F.

6. A method as set forth in claim 2 further including the step of sequentially placing the particulate silicone based material which is free of small elements which are hollow and the mixture of particulate silicone based material and small elements which are hollow in a forming cavity to

form a body having a layered construction and having a configuration corresponding to the configuration of the forming cavity.

7. A method as set forth in claim 6 further including the step of applying pressure against the layer of silicone based particulate material and against the mixture of particulate silicone based material and small elements which are hollow while they are disposed in the forming cavity.

8. A method as set forth in claim 6 wherein said step of sequentially placing the particulate silicone based material which is free of small elements which are hollow in the forming cavity includes conducting a flow of discrete particles of the silicone based material which is free of the small elements which are hollow into the forming cavity and thereafter conducting a flow of the mixture of particulate silicone based material and small elements which are hollow into the forming cavity.

9. A method as set forth in claim 6 wherein said step of sequentially placing the particulate silicone based material which is free of small elements which are hollow and the mixture of particulate silicone based material and small elements which are hollow in the forming cavity includes conducting a flow of the mixture of particulate and small elements which are hollow into the forming cavity and thereafter conducting a flow of discrete particles of the silicone based material which is free of small elements which are hollow into the forming cavity.

10. A method as set forth in claim 6 wherein said step of cooling the particulate silicone base material is performed with the body having a layered construction disposed in the forming cavity.

11. A method as set forth in claim 6 wherein said step of cooling the particulate silicone base material includes removing the body having a layered construction from the forming cavity before the body having a layered construction has cooled to ambient temperature and while the body having a layered construction is malleable.

12. A method as set forth in claim 1 wherein the particulate silicone based material comprises a silicone molding compound, a silicone resin, and a catalyst.

13. A method as set forth in claim 12 wherein the silicone molding compound comprises silica and a silsesquioxane polymer.

14. A method as set forth in claim 12 wherein the silicone molding compound is a powder and the silicone resin is a liquid, said silicone resin when mixed with the silicone molding compound being absorbed by the silicone molding compound.

15. A method as set forth in claim 1 wherein the mixture of particulate silicone based material and small elements which are hollow is formed by mixing the small elements which are hollow with a silicone molding compound and, thereafter, wetting the mixture of small elements which are hollow and silicone molding compound with a liquid silicone resin.

16. A method as set forth in claim 1 wherein at least a majority of the small elements which are hollow are spheres which have a particle size, by volume, of between 15 and 135 microns.

17. A method as set forth in claim 1 further including the step of placing a layer of silicone based material which is free of small elements

which are hollow in a forming cavity, applying pressure against the layer of silicone based material in the forming cavity, placing a layer of the mixture of particulate silicone based material and small elements which are hollow in the forming cavity, and applying pressure against the layer of the mixture of particulate silicone based material and small elements which are hollow in the forming cavity.

18. A method as set forth in claim 17 further including the steps of placing a second layer of silicone based material which is free of small elements which are hollow in the forming cavity, and applying pressure against the second layer of silicone based material in the forming cavity.

19. A method as set forth in claim 17 wherein the small elements which are hollow in the layer of the mixture of particulate silicone based material and small elements which are hollow are glass microspheres.

20. A method as set forth in claim 17 wherein the small elements which are hollow in the layer of the mixture of particulate silicone based material and small elements which are hollow are fibers.

21. A method as set forth in claim 1 further including the step of applying a covering of the mixture of particulate silicone based material and small elements which are hollow to a base member, said step of heating the mixture of particulate silicone base material and small elements which are hollow is at least partially performed with the mixture of particulate silicone based material and small elements which are hollow on the base member.

22. A method as set forth in claim 1 further including the steps of electrostatically charging particles of the mixture of particulate silicone based

material and small elements which are hollow, directing a flow of electrostatically charged particles of the mixture of particulate silicone based material and small elements which are hollow toward a base member, and electrostatically adhering the charged particles of the mixture of particulate silicone based material and small elements which are hollow to the base member, said step of cooling the particulate silicone based material is performed with the mixture of particulate silicone based material and small elements which are hollow disposed on the base member.

23. A method as set forth in claim 1 wherein said step of heating the mixture of particulate silicone based material and small elements which are hollow includes expanding the small elements which are hollow.

24. A method as set forth in claim 1 wherein said step of heating the mixture of particulate silicone based material and small elements which are hollow includes interconnecting particles of the particulate silicone based material to form one-piece in which the small elements which are hollow are at least partially disposed.

25. A method as set forth in claim 1 wherein said step of providing a mixture of particulate silicone based material and small elements which are hollow includes mixing a powdered silicone molding compound containing silica powder and a liquid silicone resin, absorbing the liquid silicone resin with the powdered silicone molding compound to form a dry particulate which flows so as to conform to the configuration of a container in which the dry particulate is placed, and mixing the small elements which

are hollow with the dry particulate to form a mixture which flows so as to conform to the configuration of a container in which the mixture is placed.

26. A method as set forth in claim 1 further including the step of injection molding the mixture of particulate silicone based material and small elements which are hollow.

27. A method as set forth in claim 1 further including the step of extruding the mixture of particulate silicone based material and small elements which are hollow.

28. A method as set forth in claim 1 further including the steps of providing a base member, and applying the mixture of particulate silicone based material and small elements which are hollow to at least a portion of the base member, said step of cooling the particulate silicone based material is performed with the particulate silicone based material disposed on the based member.

29. A method as set forth in claim 1 further including the steps of providing a turbine engine component, and applying the mixture of particulate silicone based material and small elements which are hollow to at least a portion of the turbine engine component, said steps of heating the mixture of particulate silicone based material and small elements which are hollow and cooling the particulate silicone based material include forming a covering over at least a portion of the turbine engine component.

30. A method as set forth in claim 1 further including the step of shaping the mixture of a particulate silicone based material and small

elements which are hollow to a desired configuration prior to heating the mixture of silicone based material and small elements which are hollow.

31. A method as set forth in claim 29 wherein said step of shaping the mixture of particulate silicone based material and small elements which are hollow to a desired configuration includes applying pressure against the mixture of particulate silicone based material and small elements which are hollow.

32. A method as set forth in claim 30 wherein said step of shaping the mixture of particulate silicone based material and small elements which are hollow to a desired configuration includes placing the mixture of particulate silicone based material and small elements which are hollow in a cavity having a configuration which corresponds to a desired configuration of at least a portion of the solid body which contains cavities which were formed in the particulate silicone based material by the small elements which are hollow.

33. A method as set forth in claim 31 wherein the cavity is at least partially defined by a surface of a member, said method further includes separating the solid body of particulate silicone based material from the cavity while maintaining the solid body of particulate silicone based material in engagement with the member.

34. A method of forming a heat resistant body, said method comprising the steps of:

forming a first layer of particulate silicone based material,



forming a second layer containing a mixture of particulate silicone based material and small hollow spheres adjacent to the first layer,

forming a third layer of particulate silicone based material adjacent to the second layer,

heating the first, second, and third layers to a temperature between about 200°F and 400°F, and

cooling the first, second, and third layers until a solid body is formed, said solid body being resistant to melting and thermal decomposition when heated to a temperature of at least 3000°F.

35. A method as set forth in claim 34 further including the step of applying pressure against the first, second, and third layers prior to performing said step of heating the first, second and third layers.

36. A method as set forth in claim 35 wherein said step of applying pressure against the first, second, and third layers is performed after performing said step of forming a third layer.

37. A method as set forth in claim 34 wherein said step of applying pressure against the first, second, and third layers includes applying pressure against the first layer prior to forming the second layer and applying pressure against the second layer prior to forming the third layer.

38. A method as set forth in claim 34 wherein said step of applying pressure against the first, second and third layers is at least partially performed prior to heating the first, second, and third layers to a temperature between about 200°F and 400°F.

39. A method as set forth in claim 34 wherein said step of applying pressure against the first, second, and third layers is at least partially performed after heating the first, second, and third layers to a temperature between about 200°F and 400°F.

40. A method as set forth in claim 34 wherein at least a majority of the small spheres in the second layer are microspheres having a particle size, by volume, of between 15 and 135 microns.

41. A method as set forth in claim 34 wherein said step of heating the first, second, and third layers includes interconnecting particles of the particulate silicone based material in the first layer and particles of the particulate silicone based material in the second layer and interconnecting particles of the particulate silicone based material in the second layer and particles of the particulate silicone based material in the third layer.

42. A method as set forth in claim 34 wherein the small hollow spheres are disposed only in the second layer and the first and third layers are free of small hollow spheres.

43. A method as set forth in claim 34 further including the step of shaping the first, second, and third layers to a desired configuration prior to heating the first, second, and third layers to a temperature between about 200°F and 400°F.

44. A method as set forth in claim 34 further including the step of shaping the first, second, and third layers to a desired configuration after heating the first, second, and third layers to a temperature between about 200°F and 400°F.

45. A method as set forth in claim 34 wherein said step of forming a first layer includes placing particulate silicone based material in a forming cavity to form the first layer with a configuration corresponding to a configuration of a first portion of the forming cavity, said step of forming a second layer includes placing a mixture of particulate silicone based material and small hollow spheres in the forming cavity to form the second layer with a configuration corresponding to a configuration of a second portion of the forming cavity, said step of forming a third layer includes placing particulate silicone based material in the forming cavity to form the third layer with a configuration corresponding to a configuration of a third portion of the forming cavity.

46. A method as set forth in claim 45 further including the step of applying pressure against the first, second, and third layers while they are disposed in the forming cavity.

47. A method as set forth in claim 45 wherein said step of cooling the first, second, and third layers is performed with the first, second, and third layers in the layers in the forming cavity.

48. A method as set forth in claim 34 wherein the particulate silicone based material in the first, second, and third layers comprises a silicone molding compound, a silicone resin, and a catalyst.

49. A method as set forth in claim 48 wherein the silicone molding compound comprises silica and a silsesquioxane polymer.

50. A method of forming a heat resistant body, said method comprising the steps of:

at least partially covering fibers with a silicone based material,  
heating the silicone based material and the fibers to a  
temperature between about 200°F and 400°F while the silicone based  
material at least partially covers the fibers, and

cooling the silicone based material until a solid body containing  
the fibers is formed, said solid body being resistant to melting and thermal  
decomposition when heated to a temperature of at least 3000°F.

51. A method as set forth in claim 50 wherein said step of at least  
partially covering fibers with a silicone based material includes covering non-  
woven fibers with the silicone based material.

52. A method as set forth in claim 50 wherein said step of at least  
partially covering fibers with a silicone based material includes covering  
woven fibers with the silicone based material.

53. A method as set forth in claim 50 wherein said step of at least  
partially covering fibers with a silicone based material includes covering  
chopped fibers with the silicone based material.

54. A method as set forth in claim 50 wherein said step of at least  
partially covering fibers with silicone based material includes placing fibers  
and silicone based material in a container with the fibers being at least  
partially covered by the silicone based material.

55. A method as set forth in claim 54 further including the step of  
applying pressure against the silicone based material and the fibers while  
they are in the container.

56. A method has set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes coating the fibers with silicone based material and, thereafter, placing the coated fibers in a container.

57. A method as set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes placing the fibers in a container and, thereafter, conducting a flow of silicone based material into the container.

58. A method as set forth in claim 57 further including the step of conducting a flow of silicone material into the container prior to performance of said step of placing fibers in the container.

59. A method as set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes covering fibers with a particulate silicone based material.

60. A method as set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes moving particulate silicone based material between a plurality of fibers.

61. A method as set forth in claim 50 wherein said step of heating the silicone based material and fibers includes interconnecting particles of the silicone based material to form one-piece in which the fibers are at least partially disposed.

62. A method as set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes wetting the fibers and engaging the wet fibers with particulate silicone based material.

63. A method as set forth in claim 50 wherein said step of at least partially covering fibers with silicone based material includes mixing solvent with particulate silicone based material to form a viscous body and engaging the fibers with the viscous body.

64. A method as set forth in claim 50 further including the steps of forming the silicone based material by mixing a powdered silicone molding compound containing silica powder and a liquid silicone resin, absorbing the liquid silicone resin with the powdered silicone molding compound to form a dry particulate, said step of covering the fibers with silicone based material includes covering the fibers with the dry particulate.

65. A method as set forth in claim 50 wherein the fibers are chopped fibers and said step of at least partially covering the fibers with the silicone based material includes mixing the chopped fibers with the silicone based material.

66. A method as set forth in claim 50 further including the steps of providing a base member, and applying fibers and silicone based material to the base member, said step of cooling the silicone based material is performed with the silicone based material disposed on the base member.

67. A method as set forth in claim 50 further including forming a layer of silicone based material which is free of fibers and placing the fibers which are covered with silicone based material and the layer of silicone based material which is free of fibers in engagement.

68. A method as set forth in claim 50 wherein said step of at least partially covering fibers with a silicone based material includes covering the fibers with a particulate silicone based material.

69. A method as set forth in claim 50 further including the step of applying pressure against the silicone based material and the fibers after performing said step of covering the fibers with the silicone based material.

70. A method as set forth in claim 50 further including the step of shaping the silicone based material and fibers to a desired configuration prior to heating the silicone based material and fibers to a temperature between about 200°F and 400°F.

71. A method as set forth in claim 50 further including the step of shaping the silicone based material and fibers to a desired configuration after heating the silicone based material and fibers to a temperature between about 200°F and 400°F.

72. A method as set forth in claim 50 wherein said step of at least partially covering fibers with a silicone based material includes at least partially covering ceramic fibers with a particulate silicone based material.

73. A method as set forth in claim 50 wherein said step of at least partially covering fibers with a silicone based material includes at least partially covering carbon fibers with a particulate silicone based material.

74. A method as set forth in claim 50 wherein the silicone based material includes a silicone molding compound, a silicone resin, and a catalyst.

75. A method as set forth in claim 74 wherein the silicone molding compound comprises silica and a silsesquioxane polymer.

76. A method as set forth in claim 74 wherein the molding compound is a powder and the silicone resin is a liquid, said silicone resin when mixed with the silicone molding compound being absorbed by the silicone molding compound.

77. A method of forming a heat resistant body, said method comprising the step of

- at least partially covering small elements which are hollow with a silicone based material,
- at least partially covering fibers with the silicone based material,
- heating the small hollow elements, fibers, and silicone based material to a temperature between about 200°F and 400°F while the small hollow elements and fibers are at least partially covered by the silicone based material, and
- cooling the small hollow elements, fibers, and silicone based material until a solid body is formed, said solid body being resistant to melting and thermal decomposition when heated to a temperature of at least 3000°F.

78. A method as set forth in claim 77 wherein said step of at least partially covering small elements which are hollow with a silicone based material includes forming a mixture of particulate silicone based material and the small elements which are hollow, said step of covering fibers with



the silicone based material includes covering the fibers with the mixture of particulate silicone based material and the small elements which are hollow.

79. A method as set forth in claim 77 wherein said step of covering small elements which are hollow with a silicone based material includes forming a mixture of particulate silicone based material and the small elements which are hollow, said step of covering fibers with the silicone based material includes covering the fibers with particulate silicone based material.